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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/658,393	09/10/2003	Go Saito	648.41969CX1	2265
20457	7590	08/05/2004	EXAMINER	
ANTONELLI, TERRY, STOUT & KRAUS, LLP 1300 NORTH SEVENTEENTH STREET SUITE 1800 ARLINGTON, VA 22209-9889			TOLEDO, FERNANDO L	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 08/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/658,393	Applicant(s) SAITO ET AL. <i>AK</i>	
	Examiner Fernando L. Toledo	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>09102003</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 4 – 9 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Mui et al. (U. S. patent 6,235,643 B1).

In re claims 4, 7 and 11; Mui in the U. S. patent 6,235,643 B1; figures 1 – 7 and related text, discloses forming a multilayer film including an isolation layer on a semiconductor substrate (Figures 4 and 5); forming a resist mask 408 by patterning a resist applied on the multilayer film; etching the multilayer film using the resist mask (Figures 4B and 5A); removing the resist mask after completing the etching (Figure 5B); and processing the semiconductor substrate to create a trench 416 or 518, having an upper end portion, utilizing the multilayer film having removed the resist as a mask (Figure 5C), wherein the step of processing the semiconductor substrate includes providing a roundness to the upper end portion of the trench by

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adhering a reaction product composed at least of the semiconductor substrate and a reaction gas to sidewall portions of the multilayer film (Column 8, Lines 63 – 67).

4. In re claim 7, Mui discloses wherein the step of processing the semiconductor substrate includes providing a round-off processing to the upper portion of the trench of the semiconductor substrate, using a reaction gas including hydrogen (Table 1).

5. In re claims 5 and 8, Mui discloses wherein the multilayer film includes at least a silicon nitride layer (406, 506) and a silicon oxide layer (404, 504).

6. In re claims 6 and 9, Mui discloses wherein in performing a desired round-off processing by controlling the reaction product, gaseous species, and gas flow rate to round off the upper portion or a bottom portion of the trench (Table 1).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mui as applied to claims 4 – 9 and 11 above, and further in view of Williams et al. (U. S. patent 6,589,879 B2).

Mui discloses forming a multilayer film including an isolation layer on a semiconductor substrate (Figures 4 and 5); forming a resist mask 408 by patterning a resist applied on the multilayer film; etching the multilayer film using the resist mask (Figures 4B and 5A); removing the resist mask after completing the etching (Figure 5B); and processing the semiconductor

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substrate to create a trench 416 or 518, having an upper end portion, utilizing the multilayer film having removed the resist as a mask (Figure 5C), wherein a desired round-off processing is performed by controlling etching time and bias voltage of the first etching and the second etching (Table 1).

Mui does not teach etching the semiconductor substrate by using a mixed gas including Cl_2 , O_2 , and HBr . However, Williams, in the U. S. patent 6,589,879 B2 discloses that it is well known to etch silicon substrate with a mix of gases including HBr , Cl_2 , and O_2 in order to give the trench the desired profile (Column 2, Lines 27 – 30).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to etch the silicon substrate of Mui, with Cl_2 , O_2 , and HBr , since, as taught by Williams etching silicon substrate with Cl_2 , O_2 , and HBr to give the trench the desired profile is well-known in the art.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando L. Toledo whose telephone number is 571-272-1867. The examiner can normally be reached on Mon-Thu 7am to 5:30pm.

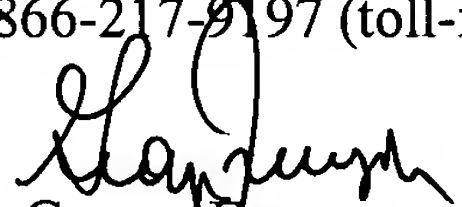
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



FToledo
2 August 2004



George Fourson
Primary Examiner
Art Unit 2823